AVR 8-bit GNU Toolchain: Release 3.3.0.364

The AVR 8-bit GNU Toolchain supports all AVR 8-bit devices. The AVR 8-bit Toolchain is based on the free and open-source GCC compiler. The toolchain includes compiler, assembler, linker and binutils (GCC and Binutils), source code libraries (AVRLibC), and debugger (GDB).

8/32-bit AVR Microcontrollers

Release 3.3.0.364

Installation Instructions

System Requirements

AVR 8-bits GNU Toolchain is supported under the following configurations

Hardware requirements

- Minimum processor Pentium 4, 1GHz
- Minimum 512 MB RAM
- Minimum 500 MB free disk space

AVR 8-bits GNU Toolchain has not been tested on computers with less resources, but may run satisfactorily depending on the number and size of projects and the user's patience.

Software requirements

- Windows 2000, Windows XP, Windows Vista or Windows 7 (x86 or x86-64).
- Fedora 13 or 12 (x86 or x86-64), RedHat Enterprise Linux 4 or 5, Ubuntu Linux 10.04 or 8.04 (x86 or x86-64), or SUSE Linux 11.2 or 11.1 (x86 or x86-64). AVR 8-bits GNU Toolchain may very well work on other distributions. However those would be untested and unsupported.

AVR 8-bits GNU Toolchain is not supported on Windows 98, NT or ME.

Downloading and Installing

The package comes in several forms.

- As part of a standalone installer (avr-toolchain-installer)
- As part of AVR Studio 5 Installer

It can be downloaded from Atmel's website at *http://www.atmel.com*

Installing on Windows

When installing as a part of AVR Studio 5 you do not have to do anything. See Release Notes for AVR Studio 5 for more details.

The AVR Toolchain Installer can be downloaded from the website as noted above. After downloading, double-click the installer executable file to install. If you wish to specify the location where the AVR Toolchain software is installed, choose "Custom Installation".

Installing on Linux

When installing as a part of AVR Studio 5 you do not have to do anything. See Release Notes for AVR Studio 5 for more details.

On Linux AVR 8-bits GNU Toolchain is also available as a TAR.GZ archive which can be extracted using the 'tar' utility. Simply extract to the location where you want the application to run from.

Upgrading from previous versions

If it is installed via AVR Studio 5 it will be upgrade trough the AVR Studio 5 upgrade. See AVR Studio 5 release notes for details.

If you used the standalone installer on MS-Windows, you might do a clean upgrade by first un-installing the old version or just upgrade using the latest installer.

On Linux, if you have it unpacked to a local folder, you just delete the old folder and unpack the latest version in a new folder.

Manifest

1. AVR 8-bits GNU Binutils 2.20.1
   - Binary utilities for AVR 8-bits target (including assembler, linker, etc.).
2. AVR 8-bits GNU Compiler Collection (avr-gcc) 4.5.1
   - C language and C++ language compiler for AVR 8-bits target.
3. AVRLibC 1.7.1
   - C Standard Library for AVR 8-bits
4. AVR 8-bits GNU Debugger (avr-gdb) 7.0.1
   - GDB is a command-line debugger.

Layout

Listed below are some directories you might want to know about.

`<install_dir>` = The directory where you installed AVR 8-bits GNU Toolchain.

- <install_dir>\bin
  - The AVR software development programs. This directory should be in your `PATH` environment variable. This includes:
    - GNU Binutils
    - GCC
    - GNU Debugger (GDB)
- <install_dir>\avr\lib
  - avr-libc libraries, startup files, linker scripts,and stuff.
- <install_dir>\avr\include
  - avr-libc header files for AVR 8-bits.
- <install_dir>\avr\include\avr
  - header files specific to the AVR 8-bits MCU. This is where, for example, #include <avr/io.h> comes from.
- <install_dir>\lib
  - GCC libraries, other libraries,headers and stuff.
- <install_dir>\libexec
  - GCC program components
- <install_dir>\doc
  - Various documentation.
- <install_dir>\source
  - Documentation on where to find the source code for the various projects and source code patches that were used to build the tools.

Toolset Background

AVR 8-bits GNU Toolchain is a collections of executable, open source software development tools for the Atmel AVR 8-bit series of Micro Controller Units (MCU). It includes the GNU GCC compiler for C and C++.

Compiler

The compiler is the GNU Compiler Collection, or GCC. This compiler is incredibly flexible and can be hosted on many platforms, it can target many different different processors/operating systems (back-ends), and can be configured for multiple different languages (front-ends).

The GCC included in AVR 8-bits GNU Toolchain is targeted for the AVR 8-bits MCU, and is configured to compile C, or C++.

CAUTION: There are caveats on using C++. See the avr-libc FAQ.

Because this GCC is targeted for the AVR 8-bits MCU, the main executable that is created is prefixed with the target name: `avr-gcc` (with '.exe' extension on MS Windows). It is also referred to as AVR GCC.

`avr-gcc` is just a "driver" program only. The compiler itself is called `cc1.exe` for C, or `cc1plus.exe` for C++. Also, the preprocessor `cpp.exe` will usually automatically be prepended with the target name: `avr-cpp`. The actual set of component programs called is usually derived from the suffix of each source code file being processed.

GCC compiles a high-level computer language into assembly, and that is all. It cannot work alone. GCC is coupled with another project, GNU Binutils, which provides the assembler, linker, librarian and more. Since GCC is just a "driver" program, it can automatically call the assembler and linker directly to build the final program.

Assembler, Linker, Librarian and More

GNU Binutils is a collection of binary utilities. This also includes the assembler, as. Sometimes you will see it referenced as GNU as or gas. Binutils includes the linker, ld; the librarian or archiver, ar. There are many other programs included that provide various functionality.

Note that while the assembler uses the same mnemonics as proposed by Atmel, the "glue" (pseudo-ops, operators, expression syntax) is derived from the common assembler syntax used in Unix assemblers, so it is not directly compatible to Atmel assembler source files.

Binutils is configured for the AVR target and each of the programs is prefixed with the target name. So you have programs such as:

- **avr-as**: The Assembler.
- **avr-ld**: The Linker.
- **avr-ar**: Create, modify, and extract from archives (libraries).
- **avr-ranlib**: Generate index to archive (library) contents.
- **avr-objcopy**: Copy and translate object files.
- **avr-objdump**: Display information from object files including disassembly.
- **avr-size**: List section sizes and total size.
- **avr-nm**: List symbols from object files.
- **avr-strings**: List printable strings from files.
- **avr-strip**: Discard symbols.
- **avr-readelf**: Display the contents of ELF format files.
- **avr-addr2line**: Convert addresses to file and line.
- **avr-c++filt**: Filter to demangle encoded C++ symbols.

See the binutils user manual for more information on what each program can do.

C Library

avr-libc is the Standard C Library for AVR 8-bits GCC. It contains many of the standard C routines, and many non-standard routines that are specific and useful for the AVR 8-bits MCU.

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NOTE: The actual library is currently split into two main parts, libc.a and libm.a, where the latter contains mathematical functions (everything mentioned in <math.h>, and a bit more). Thus it is a good idea to always include the `-lm` linker option. Also, there are additional libraries which allow a customization of the printf and scanf function families.

avr-libc also contains the most documentation on how to use (and build) the entire toolset, including code examples. The avr-libc user manual also contains the FAQ on using the toolset.

Debugging

The GNU Debugger (`GDB`) is the main package that can be used for general debugging. `GDB` is a command-line program only.

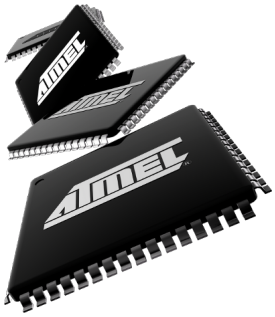
There are also alternatives for debugging and simulation. Atmel offers a free package called `AVR Studio 5` which can also do simulation. Note that `AVR Studio 5` is currently free to the public, but it is not Open Source.

New and Noteworthy

This chapter lists new and noteworthy items for the AVR 8-bit GNU Toolchain release.

AVR 8-bit GNU Toolchain

Supported Devices



AVR 8-bit GNU Toolchain supports the following devices:

Note:- Devices which are supported in this release are marked with *

at90s2313	at90s2323	at90s2333	at90s2343	attiny22
at90s4414	at90s4433	at90s4434	at90s8515	at90c8534
ata6289	attiny13	attiny13a	attiny2313	attiny2313a
attiny24a	attiny4313	attiny44	attiny44a	attiny84
attiny25	attiny45	attiny85	attiny261	attiny261a
attiny461a	attiny861	attiny861a	attiny43u	attiny87
attiny88	at86rf401	at43usb355	at76c711	atmega103
at90usb82	at90usb162	atmega8u2	atmega16u2	atmega32u2
attiny1634	atmega8	atmega48	atmega48a	atmega48pa
atmega88	atmega88a	atmega88p	atmega88pa	atmega8515
atmega8hva	at90pwm1	at90pwm2	at90pwm2b	at90pwm3
at90pwm81	at90pwm161	atmega16	atmega16a	atmega161
atmega163	atmega164a	atmega164p	atmega165	atmega165a
atmega165pa*	atmega168	atmega168a	atmega168p	atmega169
atmega169a	atmega169pa	atmega16hva	atmega16hva2	atmega16hvb
atmega16hvbrevb	atmega16u4	atmega32	atmega323	atmega324a
atmega324p	atmega325	atmega325a	atmega325p	atmega325pa
atmega3250	atmega3250p	atmega3250pa	atmega328	atmega328p
atmega329	atmega329p	atmega329pa	atmega3290	atmega3290a
atmega3290p	atmega32c1	atmega32m1	atmega32u4	atmega32u6
atmega406	atmega640	atmega644	atmega644a	atmega644p
atmega644pa	atmega645p	atmega645	atmega6450	atmega6450a
atmega6450p	atmega649a	atmega649p	atmega6490	atmega6490a
atmega6490a	atmega64c1	atmega64m1	atmega64hve	atmega32hvb
atmega32hvbrevb	at90can64	at90pwm216	at90pwm316	atmega16c1
atmega32c1	atmega16m1	atmega32m1	atmega64m1	atmega16u4
atmega32u4	at90scr100	at90usb646	at90usb647	at94k
m3000	atmega1280	atmega1281	atmega1284p	atmega128rfa1

```
at90can128      at90usb1287     atmega2560      atmega2561      atxmega16a4
atxmega16a4u*   atxmega16d4     atxmega32a4     atxmega32a4u*   atxmega32d4
atxmega32x1     atxmega64a3     atxmega64a3u*   atxmega64d3     atxmega64a1u
atxmega128a3    atxmega128a3u*  atxmega128b1    atxmega128d3    atxmega192a3
atxmega192a3u*  atxmega256a3    atxmega256a3b   atxmega256a3bu  atxmega256a3u*
atxmega256d3    atxmega128a1    attiny4         attiny5         attiny9
attiny10        attiny20        at90s1200       attiny11        attiny12
attiny15
```

New Features

No new features are added in this release

Component Upgrades

No components are upgraded in this release

Known Issues

- Support for AVR Tiny 4/5/9/10/20/40 devices is in beta stage
- Support for ATtiny1634 does not include clock_prescaler_set() and wdt_enable() macros

Contact Information

For support on AVR 8-bit GNU Toolchain please contact avr@atmel.com.

Users of AVR 8-bit GNU Toolchain are also welcome to discuss on the AVRFreaks website forum for AVR Software Tools.

Disclaimer and Credits

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